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THE WEIGHTS AND MEASURES OF LATIN AMERICA

BY

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PREAMBLE

To show the necessity of the investigation of which the following report is an analysis and forms the subject matter, the following extracts are made from writings of men of more or less prominence in scientific circles. These extracts show how easily such men may be mistaken and prove what all know but what is so often forgotten that it is dangerous to generalize when the facts are not known.

"This system is in force in all parts of Europe and America except England and our own country." — Dr. George F. Kunz, Pres. American Metric Association.

"Scarcely a vestige of the old standards is left in any country that has adopted the metric system." — Dr. Wm. C. Wells, Chief Statistician, The Pan American Union.

"The theory that old units will always live is repudiated by experience in some thirty-odd countries which have successfully adopted the metric system of weights and measures." — Mr. Howard Richards, Secretary American Metric Association.

"In less than a year one would have forgotten that there ever was any other system." — Dr. Adolph W. Miller.

"Practically all the nations of the earth have adopted the French decimal system. Only two stubborn ones hold out against it — England and the United States." — Dr. Harvey W. Wiley.

"It is practically universal throughout Central and South America." — Mr. Everett Morss.

"It is the system used in everyday life by the civilized peoples all over the world, except in America, Great Britain, and her colonies." — Dr. A. E. Kennelly, Prof. Electrical Engineering, Harvard University.

"Practically all of the civilized nations of the world have already adopted it with the exception of the English speaking peoples." — Dr. Alexander Graham Bell.

"It is the sole system in all Latin-America." — Mr. Judson C. Welliver.

"In Central and South America the metric system is practically universal." — Collier's Weekly.

"To adopt the metric system would not be harder for the United States than to adopt the daylight saving plan." — Mr. Arthur Brisbane, Editor the Hearst papers.

"The meter, liter and gram continue to prove most satisfactory in official and general use in the Phillipine Islands, *Porto Rico* [which see below] and other United States possessions." — Mr. Fred R. Drake, Chairman Executive Committee American Metric Association.

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THE WEIGHTS AND MEASURES OF LATIN AMERICA

By Frederick A. Halsey, New York
Member of the Society

"I have found in the course of my life that the particular thing that you have to surrender to is the facts."
— President Wilson.

THE inquiry of which this paper is a report was conducted through a questionnaire of which about 500 copies were distributed throughout South and Central America and the West Indies.[1] In order to secure representative and impartial distribution, outside agencies were enlisted in the work, the printed blanks being sent to their branches and correspondents by the National City Bank, the United Fruit Company, W. R. Grace and Company, and the Hill Publishing Company. Additional copies were sent out by the author to names taken from a commercial list obtained from the United Fruit Company and to United States consuls.

2 The questionnaire as drawn up in English will be found in Appendix 2, together with the form letter which accompanied it. The actual printed forms sent out were translated into Spanish and Portuguese, in which languages most of the replies came back. The information given herein is not, however, limited to that obtained through the questionnaires as various citations in the text point out. In all cases quotations without names attached are from the questionnaires.

SPANISH AND PORTUGUESE WEIGHTS AND MEASURES

3 As many readers are not acquainted with Spanish weights and measures, tables of the more common units and their relations

[1] This paper embodies the results of an investigation conducted under the auspices of the American Institute of Weights and Measures of which the author is the Commissioner.

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are here given. The translation of the Spanish names is almost self-apparent, but the following are given:

Onza	Ounce	Pulgada	Inch
Libra	Pound	Pie	Foot
Tonelada	Ton	Vara	Yard
Cuartillo	Quart		

4 The Portuguese names are so similar that their meanings will be apparent.

SPANISH WEIGHTS AND MEASURES

Weight

16 onzas = 1 libra
25 libras = 1 arroba
4 arrobas = 1 quintal
20 quintales = 1 tonelada

Dry Measure

4 cuartillos = 1 celemin
12 celemins = 1 fanega
12 fanegas = 1 cahiz

Liquid Measure

4 cuartillos = 1 azumbre
8 azumbres = 1 cantara
16 cantaras = 1 moyo

Length

12 pulgadas = 1 pie
3 pies = 1 vara

UNIFICATION OF ENGLISH AND SPANISH WEIGHTS AND MEASURES

5 With slight differences in the values of the units, this system is substantially identical with our own. With suitable foresight and effort the two might have been unified long ago.

6 The chief difficulty in the adoption of the metric system in Latin America has been and is the psychological difficulty — that is, learning to think or vizualize values in strange units. In this sense the difficulty of adopting the English values of the units would have been nil for there would have been too little change in values to cause confusion of thought, while in names there would have been none.

7 Meanwhile the still greater difficulty in our own case — the physical difficulty due to the anchorage of units in standardized manufacture — was and is absent in Latin America where but little manufacturing is done. The difficulties in the way of adopting the English values of the units thus were and are trifling in comparison

with those in the way of adopting the metric units. Moreover, the process would have been one of subtraction, two sets of values being reduced to one, and, internationally considered, several sets of values reduced to one, for the Spanish units have slight and annoying differences of value in different countries. The "adoption" of the metric system, on the other hand, has been one of addition, another set of units being added to those already existing.

8 The ease with which the English values of the units might have been adopted is shown by these reports of the progress they have made. With no trace of compulsion or even governmental recognition, they have come into large use by the operation of the forces of trade and commerce and by simple acceptance, whereas the metric units have nowhere made progress except by compulsion.

9 The remaining question is: Is it too late? Except for units for land measure, which, once established, should be let alone, I think not, for conditions have not materially changed in Latin America. It must be apparent there, as this inquiry makes it here, that the attempt to adopt the metric system is a failure. The weights and measures of Latin America are in a state of chaos, for which a remedy is sorely needed. Were they to dismiss the intruder and retain the old historic names with changes in values which are so slight as to be inappreciable for most purposes, Pan-Americanism in this important field would become an accomplished fact, and the unification of the weights and measures of North and South America with those of the British Empire would be within sight.

10 It is especially to be noted that until about the beginning of the present century there were few, if any, compulsory metric laws in Spanish America. The system had been "adopted" in many of those countries as the official system, and used chiefly for customs purposes and railway tariffs, but the people continued to use the old measures without molestation. The change in the intervening years is due to German influence and for German purposes. If, as seems probable, German influence in Spanish America is to suffer an eclipse, is it too much to hope that the future may see the unification of the weights and measures of North and South America and the British Empire on the foundation of the system which, in its basic and historic features, is common to all?

11 Meanwhile we have an important lesson to learn from Latin America. A glance through these reports will reveal the common practice of selling grain and other farm products at wholesale by *weight*, the arroba and the quintal being favorite units.

12 Our clumsy efforts to connect the bushel and pound through conversion factors are the cause of much confusion[1] which would disappear were we to copy this practice, and, incidentally, deprive the metricites of a false argument which is on all their lips, and which the unthinking know no better than to accept. The unit for this purpose should be the quintal of 100 lb. — a name which is preferable to hundredweight as it avoids confusion with the British hundredweight of 112 lb.

GENERAL ANALYSIS OF RESULTS

13 The effort to learn the relative usage of the different systems has not been successful. When one return gives exclusive use of the metric system for a given purpose and another exclusive use of the Spanish system for the same purpose, discrimination is impossible. The thing here proven is that the claim that Latin America is metric is false, as are all arguments based upon it. In particular, it should be noted that the order in which the units are herein named has no significance.

14 In but one of the countries investigated (Uruguay, which see below) can the metric system be said to be adopted for domestic trade, while there we find an authorized official exception in the case of real estate, as we find other exceptions in the cases of wearing apparel, industry and navigation. Nevertheless, in twelve of these twenty countries, according to the Director of the Bureau of Standards, the metric system is "obligatory." [2]

15 In ten of these countries (apart from the railroads and other fields under immediate government control) the metric system has made very little impression. (Nicaragua, Guatemala, Spanish Honduras, Cuba, Panama, Colombia, Porto Rico,[3] San Salvador, Ecuador, and Costa Rica, which see below.)

[1] It should be noted that the adoption of the metric system would not do away with this confusion since wheat, corn, rye, etc. do not weigh the same per decaliter any more than they do per bushel. The sale of these and similar commodities by *weight* is the simple and sufficient method of abolishing all the confusion now experienced in this branch of trade.

[2] See The Metric System in Export Trade by the Director of the Bureau of Standards, page 17; Senate Document No. 241, Government Printing Office, 1916.

[3] Porto Rico is always claimed by the metricites to be metric. Thus, according to Mr. Fred R. Drake, Chairman Executive Committee, American Metric Association, "The meter, liter and gram continue to prove most satisfactory in official and general use in the Philippine Islands, *Porto Rico* and other United States possessions."

16 Of these ten countries, according to the above report, the metric system is "obligatory" in seven. In five of them (Cuba, Colombia, Porto Rico, Panama, and Spanish Honduras, which see below) the English units are used far more than the metric, having largely supplanted all others, although in three of them, according to the report mentioned, the metric system is "obligatory." Not only has the English pound come into large use, but the arroba and quintal have been adjusted in value to make them equal to 25 and 100 English pounds, respectively. In substantially all of the countries investigated the English inch is used for mechanical purposes, as the English nautical units are used for navigation and sea shipments. That most derided of English units — the nautical mile — is used by all countries that sail the seas and they use no other. The kilometer is an unknown measure at sea.

17 In all countries the impression made is in direct relation to the severity of the laws, of which we have the climax in Uruguay (see Uruguay below), with Venezuela and Argentina not far behind. In all cases the movement was begun with mild laws under the impression that the adoption of the system was a simple and easy thing to bring about. Such laws failing, more drastic ones followed, but even these have been but partially effective. The greatest progress has been made in the field of domestic retail trade, in which weights and measures are under the immediate eye of officers of the law.

18 It is this field which comes under the observation of tourists. One may tour through, or, for that matter, live in a country for many years, in many walks of life, and experience but little contact with weights and measures outside the field of retail trade, and we thus see why the reports of tourists are more favorable to the metric system than the facts justify, as we also see why the observations of tourists, in a comprehensive sense, have very limited value.

19 The further we get from the field of retail trade, the less is the system used. In this field the progress is chiefly with units of weight and capacity, the measure of length for the sale of drygoods being commonly the vara, while imported wearing apparel of all kinds is commonly sold by the units of the country of its origin, by the inch at least as much as the centimeter, and domestic products are frequently made to numbered sizes, of which the relation to any system of units is not apparent. They are not metric.

20 In primary or wholesale markets the old measures prevail,

although these, in some cases, have been adjusted in value to make them even multiples of English basic units. We have here perfect examples of the simple process of unification of English and Spanish measures which, with proper encouragement, might by this time have become substantially universal.

21 Lumber and timber are almost universally sawn to the inch, although frequently mixed with the vara or the meter for length, and the square and cubic meter as sales units, prices being made at so much per square or cubic meter for one-inch boards.

22 In the mechanical trades tailors and seamstresses use all three systems, as do stone and brick masons, while carpenters commonly use the pulgada or inch. In machine shops both English and metric units are used, depending chiefly on the country of origin of the machines they have to repair. The inch is predominant.

23 In this connection we have the report of the Cleveland Twist Drill Company that shipments of their tools to South America are "95 per cent to 100 per cent English," and of the Detroit Twist Drill Company that "All of our South American customers use more English sizes than metric." Needless to say, English-sized twist drills are bought in order to make English-sized holes, for they will make no other.

24 In ship and boat building, also, the English units find large use, while in mining and smelting we find a miscellaneous mixture of all three systems.

25 The persistence of old units is most pronounced in the measurement of land. When units of measure are once anchored in titles to real estate, they are there to stay. Of this we have perfect examples in the use of the French arpent in Louisiana and the Spanish vara in Texas, in which states those units are today the common units of land measure. Another example is found in France, where, in some sections, the old units of land measure are still predominant.

26 When outlying districts are incorporated within city limits, parcels of land are much reduced in size and smaller units come in. This gives an opportunity for the introduction of the metric system, but with the result that, in the older portions of the town, the old units are used, while in the newer portions we find the new ones.

27 Similarly, initial surveys of the *hinterland* give an opportunity for the use of new units, but again with the result that the older portions of the country are measured in one set of units and the newer in another.

28 In Uruguay, where the laws are more severe and more rigidly enforced than in any other country, it has been found necessary to authorize the use of old units for the measurement of land (see Uruguay below), while in other countries the laws, in this application, are quietly ignored. This is the more significant because all transfers of real estate, as matters of public record, come before the eyes of officers of the law. In other countries, again, the purchase and sale are made in Spanish units and the day is then saved by inserting metric equivalents in the documents of record.

29 In marine measurements and sea shipments the English system is used everywhere, although mixed with metric units, especially for inland navigation.

30 Classified in another way, the most-used metric units are those of capacity. Next come those of weight, and, trailing far in the rear, those of length and their correlatives of area. This is in accordance with a law which long ago made itself apparent.

THE REASON WHY COMPULSORY METRIC LAWS FAIL

31 A few words in explanation of the failure of even drastic laws for the adoption of the metric system are here appropriate. Such laws fail because established and harmless practice cannot, except in a technical sense, be made a crime. Fancy an American grocer arrested, haled to court, fined, and even sent to jail for selling sugar by the pound — a thing that has been done since the Pilgrim fathers landed at Plymouth Rock. And yet this is exactly what they do in Uruguay. Place a meter and a yardstick alongside. They differ in value by about 10 per cent. Is it conceivable that selling by one can be made a virtue and by the other a crime? Fancy an American jury convicting a merchant of a crime for selling drygoods by the yard! And yet this is precisely the meaning of compulsory laws.

32 It is a truism of law that excessive penalties cannot be enforced and so defeat themselves, and is it not clear that compulsory metric laws in any country in which the people have rights are unenforceable, and that the more drastic they are, the more unenforceable they become?

TREATMENT OF GENERAL AND OBSCURE REPLIES

33 In the following summary, Spanish and Portuguese names are used for Spanish and Portuguese, and English names for English,

units. In a few cases returned questionnaires in English have used the word *pound* when those in Spanish from the same countries have used *libra*. In such cases, pound has been taken as meaning libra. Again, pulgada or pollegada has been used for commodities (e.g., pipe) which are obtained from the United States and Great Britain and in such cases those words have been understood to mean inch.

34 The English inch is used so much in Latin America that in these reports it is sometimes called the pulgada without qualification. This, in a few cases, has made it impossible to distinguish with certainty between the pulgada and the inch. The same condition and remark apply, although to a smaller degree, to the libra and pound, *but in neither case is there any uncertainty regarding the non-use of the metric system.*

35 When the reports show, as they often do, sales to be made by the unit, dozen or hundred, the information has been omitted as having no significance. Similarly, such expressions as "by arrangement," "bale," "sack," "as per contract," "in packages of various weights," "by weight," "conventional," "lineal and square measures," "no fixed standard," "load of an animal," "special standards," of which there are many, convey no definite information and have been ignored. The expressions "American measurements" and "English measurements" have been translated into English units when they are sufficiently well defined by custom. The expressions "metric" and "metric system" have been treated similarly when the units used are known or made clear in other questionnaires, but it has sometimes been necessary to use the inclusive term "metric." "English system" and equivalent expressions have also been used in some cases. In several reports on wearing apparel, numbered sizes are given. In some cases these are clearly inches or centimeters and have been so translated. In other cases they are local and impossible to translate into any system of units, and have been so given.

36 The word quintal (in some countries called cental) invariably means the Spanish quintal of 100 libras, and, similarly, tonelada means the Spanish ton of 2000 libras. In those cases in which the metric quintal of 100 kilograms and the metric ton of 1000 kilos have been reported, those units are designated as metric quintal and metric ton. Some of the reports show incongruous units for certain purposes, but they are, of necessity, repeated here.

THEORIES DISPROVEN

37 On its face, this Report sets forth a volume of facts regarding the weights and measures of Latin America, but, in addition to this, it disproves many theories.

38 The first theory is that it is an easy and simple matter for a country to change its system of weights and measures. Here we have the results of twenty attempts to bring about this change, most of which date from about the middle of the last century. With but one exception the result has been grotesque failure, while in none has the attempt to retire old units been successful.

39 It is on this theory that the entire metric case is based. Once one has accepted the idea that a country may easily change its weights and measures, it is a short step to the conclusion that those who have tried it have succeeded, and then another short step to the conclusion that we can succeed. The question at issue is one not of belief but of fact. With twenty failures after, in most cases, more than a half century of effort, the fact is proven.

40 The second theory is that the adoption of the metric system does away with confusion of weights and measures. These reports show that the actual result is to increase and not eliminate confusion.

41 The third theory is that the metric system is in universal use, except in the United States, the British Empire and Russia. These reports show that in no country investigated is the system universal.

42 The fourth theory is that we must adopt the metric system if we are to succeed in selling goods to Spanish America. These reports show that if we are to change our weights and measures in order to conform to the practice of Spanish America, we should adopt the Spanish and not the metric system.

43 The fifth theory is that the "adoption" of the metric system leads to an important saving of time in primary education. Clearly, with a mixture of systems in use, children have more and not less to learn.

44 The sixth theory is that the adoption of the metric system leads to a saving of time in calculations. Clearly, with this mixture of systems in use, involving the constant necessity for conversions between them, the labor of calculations is increased and not reduced. For example, consider the purchase at wholesale by the meter and the sale at retail by the vara.

45 The seventh theory is that the persistence of old units in metric countries is a persistence of names but not of things — that the practice is nothing more than the use of old names for new units. One of the most recent formal statements of this theory is by Dr. William C. Wells, Chief Statistician of the Pan-American Union, who says (*Bulletin* of the Pan-American Union, January 1917):

> It has been found somewhat difficult in countries adopting the metric scale to do away with the names of the most-used measures such as yards, quarts, pounds, miles etc., or rather of the equivalents of those English words in the language of the country adopting the metric system. . . . It has been found very easy to substitute the thing, although sometimes difficult to substitute the word. . . . Scarcely a vestige of the old system is left in any country that adopted the metric system. Now and then in Latin American countries one will hear the old words, but almost always with a meaning adapted to the new scale.

46 These replies are sprinkled with such expressions as these:

"Same as in the United States." "English sizes." "For distance, the English mile." "English and metric system." "French and American indiscriminately." "Thickness of lumber is always in English inches." "Metric system infrequently." "The two standards are used indiscriminately." "The meter is used very little." "The artisans of the country use in their calculations the Spanish vara as their standard." "Our standard of weight is the quintal of 100 Spanish pounds." "The people continue to use the old Spanish measures." "At retail, vara; at wholesale, yard, meter." "While the metric system is legal it is not enforced." "In domestic business, only the Spanish system is used." "A few French articles are in metric sizes." "The cuadra is still commonly used, but is prohibited in the documents." "The English measures prevail." "Generally the English foot, exceptionally the meter." "The old Brazilian system is still commonly used." "Cloths are sold indiscriminately by meters, varas and yards." "Occasionally the metric ton." "The metric measurements are sometimes used."

Such expressions as the above, of which there are many more, cannot be thus explained.

47 Many of these reports *give values of the Spanish in terms of metric and English units* which show that the old names are not used for the new units. Of these, a few of many examples follow (note that the libra is *not* a half kilogram):

From Costa Rica: Vara, 0.836 meter; libra, 460 grams; cuartillo, 4.165 liters; botella, 0.67 liter; manzana, 6988 square meters.

From Argentina: Vara, 0.866 meter; pie, 0.289 meter; libra, 0.4594 kilogram; tonelada, 918.8 kilograms.

From Nicaragua: Vara, 33 inches; libra, 16 onzas; fanega, 288 libras; manzana, 10,000 square varas.

From Ecuador: Vara, 84 centimeters; libra, 16 onzas; cuadra, 100 square varas.

From Guatemala: Vara, 2.78 feet; manzana, 10,000 square varas; caballeria, 64 manzanas; cuadra, 625 square varas.

From Mexico: Vara, 2.7 feet; onza, 1.0148 ounces avoirdupois; cuartillo, 1.7 quarts; sitio, 1755 hectares; caballeria, 42 hectares.

From Venezuela: Vara, 0.836 meter; pie, 0.279 meter; pulgada, 0.023 meter; libra, 460 grams; arroba, 11.5 kilograms.

From Honduras: Vara "about 33 inches"; manzana, "100 square English yards."

From Brazil: Libra, 0.45905 kilogram; arroba, 14.6896 kilograms; oitava, 3.586 grams; quartilho, 0.665 liter; canada, 2.662 liters.

From Peru: Vara, 83 centimeters; topo, 5000 square varas, or 3485 square meters; quintal, 46 kilograms; marco, 228 grams.

From Chile: Quintal, 46 kilograms; arroba, 11½ kilograms; corcada (cord for firewood), 6 pies × 3 pies × 3 pies.

48 More might be given to the point of weariness, but the above are sufficient. Not one of all of these hundreds of sheets contains a single item to substantiate the theory advanced by Dr. Wells. No proof of it has ever been offered; it is clearly untenable and must be dismissed.

49 The eighth theory is that we will use metric equivalents for English sizes, or, as the metric party put it, "Whatever is manufactured must be actually the same size or weight as before. It is merely a matter of a new term of expression." Nothing to justify this theory can be found in these papers, no single example of this practice being found therein. Articles manufactured to the inch (wearing apparel, pipe, lumber, etc.) are uniformly sold by the unit to which they were made.

THE RESULT OF A GREAT SERIES OF EXPERIMENTS

50 We have in this Report a composite picture of the result of many attempts to adopt the metric system, that result being uniformly the addition of that system to those previously prevailing, and it is this that we must contemplate as the result of the attempt to adopt it here. We must compare what we have with what we will get, not with what one may hope we will get. Moreover, it must be noted that had all these countries succeeded in this great experiment, it would have no significance for our guidance, because of the greater importance of our manufacturing industries. France adopted the system before the beginning of the manufacturing era, and Germany adopted it before the development of manufacturing in that country. Everyone knows that the rise of Germany as a manufacturing nation began after the war of 1870. South American countries are not

manufacturing countries. More manufacturing is done in the city of Philadelphia than in all South America.

51 We see then that, in western Europe, the system was adopted before the development of manufacturing and that manufacturing has developed with and in it, while in South America practically no manufacturing is carried on.

52 Great Britain and we are the first to be asked to change our manufacturing units for which there is not a shadow of a precedent.

53 Seldom has an effort of such magnitude been made. We have here a record of twenty experiments on a national or, collectively, a continental, scale, and their net result is to demonstrate the wisdom of the conclusion arrived at by John Quincy Adams after four years of investigation and nearly a century ago:

> The substitution of an entire new system of weight and measures instead of one long established and in general use, is one of the most arduous exercises of legislative authority. There is, indeed, no difficulty in enacting and promulgating the law, but the difficulties of carrying it into execution are always great and have often proved insuperable.
>
> The legislator . . . finishes by increasing the diversities which it was his intention to abolish, and by loading his statute books only with the impotence of authority and the uniformity of confusion.

It is to protect our country from this "uniformity of confusion" that we are fighting.

THE RESULTS ARE NOT SURPRISING

54 Some who read this Report will, no doubt, be surprised at the condition disclosed in Spanish and Portuguese America, but there is no reason why any one should be surprised as no one has seen the first scintilla of proof to the contrary. Assertions and assumptions have been repeated so many times that, no doubt, in some cases, they have been accepted as true, but no proof has been presented and there is no proof. On the contrary, those who know weights and measures, who know the gigantic character of the task which confronts any nation which sets out to change them, know that the inherent probabilities are all in favor of the condition set forth.

55 Do not confound legislation for the adoption of the metric system with its real adoption. All experience shows that while such legislation is fatally easy, the adoption of the system is impossible, the effect of the laws being to bring about nothing but the confusion and disorder that prevail throughout Latin America. Every success in the attempt to persuade some interest to introduce the system is

but a step toward the confusion that prevails throughout Latin America. We have there twenty countries in which the experiment has been made with the uniform result of grotesque failure. Every expectation has been falsified and every prediction inverted. Shall we take warning, or shall we plunge headlong into this metric morass?

56 Following are the summarized replies to the questionnaires:

APPENDIX 1

ARGENTINA

(Summary of eleven returned questionnaires)

Groceries: Kilogram, liter, pound. *Fruits:* Kilogram. *Milk:* Liter. *Butter and Cheese:* Kilogram. *Other Farm Products:* Kilogram, liter. *Hardware:* Kilogram, centimeter, inch, meter, yard. *Fish:* Kilogram. *Meat:* Kilogram. *Flour:* Kilogram. *Tea and Coffee:* Kilogram. *Dry Goods:* Meter, yard. *Fuel:* Kilogram. *Tobacco:* Kilogram.

Ready-Made Clothing: Centimeter, inch, local numbers. "The measurements of these articles are expressed in the trade in English or metric units according to their source. Clothing, collars, hats, etc., imported from England are measured in inches and those from France in metric units." *Hats:* Centimeter, local numbers, inch. (See clothing above.) *Collars:* Centimeter, inch. "Best stores have conversion tables to inches." (See clothing above.) *Underwear and Hosiery:* Inch, centimeter. *Shoes:* Centimeter. "Imported shoes in English sizes. Local manufactures to special Argentine numbers." "The point corresponding to one-quarter of the old French inch." *Gloves:* Centimeter. *Corsets:* Centimeter.

For the Measurement of Land: Hectare, square meter, cuadra, league, vara. "Lots of land are sold in most cases by the square vara." "In many places the vara is used, also the cuadra, but these measures are not legal." "In Buenos Aires the old vara is still quite frequent." "The real estate dealers are accustomed to sell city lots by the square vara, although according to law they are liable to a severe penalty."

Lumber and Timber: Inch, foot, meter. "English measurements, though some sales are based on length in meters." "Length always in meters, breadth and thickness more often in inches." "Chiefly English measures." "By the cubic meter and square meter for 1 inch in thickness."

By Carpenters and Other Woodworkers: Metric, English. *By Stone and Brick Masons:* Metric. *By Tailors and Seamstresses:* Meter, centimeter.

In Machine Shops: Meter, inch, millimeter, centimeter, gram, kilogram. "Sizes in English measures." "Iron measurements in inches, otherwise kilo and centimeter."

In Contracts for Excavation of Ground: Cubic meter, square meter, kilogram. *In Mines and for Mining Products:* Metric ton, kilogram, meter. *In Smelting and for Smelter Products:* Meter, pulgada, kilogram, metric ton. *Sizes of Pipe for Gas, Water, Sewers, Etc.:* Length, meter; diameter, meter, foot, inch; weight, kilogram. "Meter for large sewer pipes; soil pipes, English and metric; gas and water pipes, inch."

In Ship and Boat Building: Meter, foot, inch, kilogram. *Marine Measurements:* Kilometer, meter, pie, ton, mile, knot, cubic foot. "Distances, maritime miles; charts, feet; tonnage and displacement, same as England and United States." "English measures." "As regards marine measurements, although contrary to legal provisions, people use for distance the marine mile. Charts of bays: Depths are expressed in English feet or in fathoms of 6 ft. Tonnage is expressed in Moorson tons. Displacement is expressed in English tons. Freight, English ton, metric ton."

Hay at Wholesale: Kilogram, metric ton. *Grain at Wholesale:* quintal, hectoliter, kilogram. *Meat at Wholesale:* Kilogram. *Root Crops at Wholesale:* Kilogram. *Coffee at Wholesale:* Kilogram. *Milk at Wholesale:* Liter. *Butter and Cheese at Wholesale:* Kilogram. *Garden Products at Wholesale:* Kilogram. *Rubber at Wholesale:* Kilogram.

Railway Tariff for Passengers and Freight (Load and Distance): Kilogram, metric ton, kilometer. *Loads and Rates for City Transportation:* Kilogram, metric ton. *Loads and Rates for Transportation by Muleback Across the Mountains:* Kilogram. *Railway Track Gages and Length of Lines:* Distances, kilometer; gage, English, metric. *Railway Equipment (units used in the construction and repairing of locomotives, cars, etc.):* English, metric.

"The only legal units for any business transaction are the metric system, but through a bad habit there has been introduced in common language the indiscriminate use of the American and Canadian legal measurements."

Mr. E. F. Du Brul writes from Buenos Aires: "Many quotations on the market are made in tons, pounds, etc. City land is sold by the square vara. Wine, etc., is sold by the pipe and barrel. I notice advertisements in the street cars of wine sold by the frasco. As large estancias change hands they are sold by the square legua. I notice that there is one ton of 918.8 kilos. I have run into a few others; for example, a metric ton of 1000 kilos; another of 1004 kilos; another of 1016 kilos, and another of 1018 kilos. Many building operations are conducted on the old Spanish measurements. Machinists and others are extremely familiar with English measurements as well as Spanish and metric because they have to use all three of them." Mr. Du Brul encloses a price list of files made in Germany and sold in Buenos Aires, and the lengths are given in all cases in pulgadas.

According to a standing announcement in THE JOURNAL of The American Society of Mechanical Engineers, the Republic of Argentina specifies that all steam boilers for government use are to be made to the Society's code. This code is the most elaborate piece of standardization ever undertaken. It includes a profusion of formulæ and specifications of the properties of materials and the strength of all parts *in English units exclusively.*

The Boston Pressed Metal Company write: "Shipments to Argentine are handled by our agent at Buenos Aires and standard English sizes are accepted and used without question. In fact, there has never been any suggestion that metric sizes were required or preferred."

The foregoing clearly shows the erroneous character of the report of the International High Commission on the Metric System in Export Trade prepared by the Bureau of Standards, to the effect that the Metric System is "obligatory" in Argentina. The same holds true, also, in respect to conditions in Brazil, Chile, Colombia, Costa Rica, Cuba, Guatemala, Mexico, Nicaragua, Peru, Spanish Honduras, and Uruguay, as shown by the summaries of the questionnaires returned from these countries, given below.

Argentina "adopted" the metric system in 1863.

BOLIVIA

The report of Mr. W. A. Graham Clark, Commercial Agent of the Department of Commerce and Labor, Part IV, published by the Department in 1911, contains the following: "Bolivia has officially adopted the metric system, but the old Spanish weights and measures are those commonly used. All cloth is retailed by the vara."

BRAZIL

(Summary of thirty-seven returned questionnaires)

Groceries: Liter, kilogram, gallao, arroba, gram. *Fruits:* Kilogram, arroba, alqueire; conserves in ½-kilo cans. *Milk:* Liter, garrafa of ⅔ liter. *Butter and Cheese:* Kilogram, libra; butter in packages of ½, 1 and 7 pounds and ¼, ½, 1, and 3 kilograms. *Other Farm Products:* Cargueire quarta, kilogram, metric pound, liter, arroba. *Hardware:* Inch, kilogram, meter, centimeter, millimeter, metric ton, liter (*sic*). "Use all measures." *Fish:* Kilogram. *Meat:* Kilogram, liter (*sic*), arroba. *Flour:* Liter, kilogram, alqueire. *Tea and Coffee:* Tea in cans of ¼, ½, 1 and 5 English pounds and by kilogram; coffee, kilogram.

Dry Goods: Meter, jarda, covado.

Fuel: Wood, cubic meter, carroca, cargueire; coal, metric ton, kilogram; oil, kilogram and liter.

Tobacco: Kilogram, meter, arroba; fine tobacco, onca.

Ready-Made Clothing: Centimeter, meter. *Hats:* Brazilian, English, Italian and Portuguese numbers, centimeter, inch, meter (*sic*). *Collars:* Centimeter, meter (*sic*). *Underwear and hosiery:* Underwear, centimeter; hosiery, inch, centimeter, meter. *Shoes:* Centimeter, numbered sizes by no apparent system, English, Portuguese, meter (sic). *Gloves:* Letter sizes, numbered sizes by no apparent system, centimeter, inch. *Corsets:* Centimeter, meter (*sic*).

For the Measurement of Land: In the farming districts: Meter, square meter, alqueire, hectare, leagua, braca, are, palmo, pollegada (*sic*), paulista, front foot, tarefa. "For agricultural lands or open lands in general the division is almost universally into alqueires." "The old Brazilian leagua is generally used. "The standard throughout the State is the alqueire." In the smaller towns: Braca, alqueire, square meter, tarefa, vara, hectare, palmo, front meter, are, pollegada (*sic*). In cities: Meter, square meter, braca, are, palmo, pollegada (*sic*), hectare.

Lumber and Timber: Palmo, foot, inch, pie, pollegada, meter and palmo for length, square foot, cubic meter, centimeter. "Thickness of lumber always in English inches. Width in Eng-

lish inch by the lumber company, and Portuguese inch by others. The lengths in feet by the lumber company and Portuguese inches by others."

By Carpenters and Other Woodworkers: Meter, inch, foot, palmo, pollegada, centimeter. *By Stone and Brick Masons:* Meter, cubic meter, square meter, pollegada, centimeter, palmo. *By Tailors and Seamstresses:* Meter, centimeter.

In Machine Shops: Meter, foot, inch, palmo, kilogram, metric ton, gram, liter (*sic*). "The metric system was established by law under the Empire as the only official system. The English system, especially for metal work, is very popular."

In Contracts for Excavation of Ground: Cubic meter, palmo, braca. *In Mines and for Mining Products:* Meter, cubic meter, metric ton, kilogram, gram, oitavo, carat. *In Smelting and for Smelter Products:* Cubic meter, metric ton, inch, (*sic*) centimeter, (*sic*) kilogram, gram. *Sizes of Pipe for Gas, Water, Sewers, Etc.:* Inch, centimeter, meter for length. "English system chiefly; metric system infrequently." "For the measurement of earthen pipes, the internal diameter is usually given in inches. Metal tubing for gas and water is measured by weight, per kilogram. Diameters are usually measured in inches and lengths in meters." "The English measures prevail."

In Ship and Boat Building: Meter, yard, foot, inch. "Generally the English foot; exceptionally the meter." *Marine measurements:* Marine mile, foot for harbor charts, meter; freight by metric ton, cubic meter, kilogram; depths in meters or feet; knot, league. "English mile for distance; English foot for drafts." "English system." "The nautical mile is most commonly employed; Lloyds' registry is used in calculating tonnage." "Distances, English mile; tonnage, English ton; draft, English foot."

Hay at Wholesale: Arroba, kilogram. *Grain at Wholesale:* Liter, kilogram, prato, cargueiro quarta, alqueire, arroba. *Meat at Wholesale:* Kilogram, arroba. *Root Crops at Wholesale:* Kilogram, arroba, amarrado, metric ton. *Coffee at Wholesale:* Kilogram, arroba. *Milk at Wholesale:* Liter. *Butter and Cheese at Wholesale:* Kilogram, libra, jaca, arroba. *Garden Products at Wholesale:* Liter, kilogram. *Rubber at Wholesale:* Kilogram, arroba.

Railway Tariff for Passengers and Freight (Load and Distance): Kilometer, metric ton, cubic meter. *Loads and Rates for City Transportation:* Kilometer, tonelada, cubic meter, arroba, metric ton, kilogram. *Loads and Rates for Transportation by Muleback Across the Mountains:* Arroba, kilogram. *Railway Track Gages and Length of Lines:* Meter, kilometer, centimeter. *Railway Equipment* (*units used in the construction and repairing of locomotives, coaches, etc.*): Inch, foot, kilogram, meter. "Weight, kilo; measure, English inch."

"The official system of weights and measures, etc., is the metric system. However, the old Brazilian system is still commonly used."

Brazil "adopted" the metric system in 1862.

CHILE

(Summary of ten returned questionnaires)

Groceries: Libra, kilogram. "Generally the libra." *Fruits:* Libra, kilogram. *Milk:* Liter, hectoliter, botella = 2/3 liter. *Butter and Cheese:* Libra, kilogram. *Other Farm Products:* Libra, kilogram, quintal, fanega. *Hardware:* Libra, kilogram. *Fish:* Libra, kilogram. *Meat:* Kilogram, libra. "Live cattle, kilo; meat, libra." *Flour:* Libra, kilogram, arroba, quintal. *Tea and Coffee:* Libra, fanega, quintal, kilogram.

Dry Goods: Vara, yard, meter. "Wholesale, yard; retail, vara."

Fuel: Kilogram, raja, cubic meter, decaliter (*sic*), almud, fanega, tonelada, metric ton, cordada.

Tobacco: Libra, quintal, kilogram, gram.

Ready-Made Clothing: Centimeter, inch. "As in United States and England." *Hats:* Local numbers, inch, centimeter. *Collars:* Centimeter. *Underwear and Hosiery:* Centimeter, inch. "As in the United States." *Shoes:* Centimeter. *Gloves:* "English sizes," local numbers, centimeter. *Corsets:* Centimeter, inch. "French and English," "English sizes."

For the Measurement of Land: In the farming districts: Hectare, cuadra, caballeria, leagua. In the smaller towns: Hectare, meter, cuadra, square meter, caballeria, potrero. In cities: Square meter, square vara.

Lumber and Timber: Inch, square foot, foot, board foot, cubic yard. "Sizes as in United States." "Length of native wood in Spanish varas."

By Carpenters and Other Woodworkers: Inch, foot, square foot. "The measures generally used are the foot and inch, rarely the meter." "The meter is sometimes used for the sizes of

beams." *By Stone and Brick Masons:* Square meter, cubic meter, inch, centimeter. *By Tailors and Seamstresses:* Centimeter, meter, vara.

In Machine Shops: Inch, foot. "In repair work on English and American machinery, feet and inches; on German, French and Italian, metric."

In Contracts for Excavation of Grounds: Cubic meter, vara, pie. *In Mines and for Mining Products:* Quintal, cubic meter, kilogram, tonelada, metric ton. "Long tons for ores for England; short tons for American purchase; metric for local smelters; Troy and metric for assays." *In Smelting and for Smelter Products:* Tonelada, kilogram, cubic meter, quintal. *Sizes of Pipe for Gas, Water, Sewers, Etc.:* Inch, foot, centimeter for sewer pipe.

In Ship and Boat Building: Tonelada, pie, pulgada, foot, inch, meter, centimeter. *Marine Measurements:* Mile, knot, kilometer, braza (fathom), ton. "For distances, the English mile; for charts of bays, the meter; for tonnage, the metric ton; for displacement, the metric ton; for freight and bulk, meter and metric weight." "English maritime mile."

Hay at Wholesale: Fanega, metric ton, kilogram, quintal, metric quintal, arroba. *Grain at Wholesale:* Fanega, arroba, quintal, metric quintal, kilogram, hectogram. *Meat at Wholesale:* Kilogram. "Wholesale, per kilo; retail, per libra." *Root Crops at Wholesale:* Quintal, libra, kilogram, arroba. *Coffee at Wholesale:* Quintal, fanega, kilogram, metric quintal. *Milk at Wholesale:* Hectoliter, liter, botella (2/3 liter). *Butter and Cheese at Wholesale:* Libra, quintal, kilogram, arroba. *Garden Products at Wholesale:* Quintal, kilogram, arroba. *Rubber at Wholesale:* Quintal.

Railway Tariff for Passengers and Freight (Load and Distance): Metric quintal, tonelada, kilogram. *Loads and Rates for City Transportation:* Quintal, tonelada, cubic meter. *Railway Track Gages and Length of Lines:* Meter, kilometer. *Railway Equipment (units used in the construction and repairing of locomotives, cars, etc.):* Kilogram, inch, foot, quintal.

"The addition of the metric system has merely added an additional system without any visible advantage. So long as the Anglo-Saxon dominates in the manufacturing world, feet, inches and pounds will be used here." "All measures are mixed. Besides metric, avoirdupois weight and feet there are many Spanish and local measures like the cajon, marco, fanega, Spanish quintal, etc." "The libra is most frequently used in the purchase and sale of goods for daily consumption." "In machine shops it may be said that up to the present the foot and inch have predominated." "The sales of the leading product of this section, nitrate of soda, are made commercially in Spanish quintals." "The Chilian hydrographic charts have scales in several units, — cables, meters and geographic miles."

The report of Mr. W. A. Graham Clark, Commercial Agent of the Department of Commerce and Labor, Part IV, published by the Department in 1911, contains the following: "Chile has officially adopted the metric system, but in the shops throughout the country the vara is still the recognized length for retail selling."

Chile "adopted" the metric system in 1858.

COLOMBIA

(Summary of five returned questionnaires)

Groceries: "Pound and arroba of 25 English pounds," kilogram, quintal. *Fruits:* Pound, kilogram, quintal, arroba. *Milk:* Botella of 360 and 750 grams. *Butter and Cheese:* Pound, libra, arroba, metric pound. *Other Farm Products:* Pound, arroba, kilogram, quintal. *Hardware* "American and English measurements generally." "English pound or arroba of 25 English pounds." *Fish:* Pound, "arroba of 25 English pounds." *Meat:* Pound, libra, arroba. *Flour:* Libra, pound. *Tea and Coffee:* Libra, pound, ounce, kilogram.

Dry Goods: Yard, vara, meter. "Cloths are sold indiscriminately by meters, varas, or yards according to the origin of the goods or the whim of the buyer."

Fuel: Kilogram, burro, arroba, metric ton, English ton and pound.

Tobacco: Libra, arroba, pound.

Ready-Made Clothing: "American and French measurements." *Hats:* "American and French measurements." "Spanish sizes." Collars: "American and French measurements." *Underwear and Hosiery:* "American and French measurements." "Spanish sizes." *Shoes:* "American and French measurements." "Spanish sizes." *Gloves:* "American and French measurements." *Corsets:* "American and French measurements."

For the Measurement of Land: In the farming districts: Hectare, fanegada, cabuya. In the smaller towns: Cabuya (50 brazas), square vara. In cities: Square vara, square meter, square yard. "The real-estate documents always give the measure that is used indiscriminately."

Lumber and Timber: Square foot, metric, "Standard board sizes in inches."

By Carpenters and Other Woodworkers: Square foot, "Feet and inches and metric system about equally." *By Tailors and Seamstresses:* Metric, inch. *By Stone and Brick Masons:* Square foot.

In Machine Shops: Meter, foot, "English system."

In Contracts for Excavation of Ground: Cubic meter. *In Mines and for Mining Products:* "English." *In Smelting and for Smelter Products:* "English." *Sizes of Pipe for Gas, Water, Sewers, Etc.:* "English measures."

In Ship and Boat Building: Cubic ton, "English measures." *Marine Measurements:* Mile, "Metric measurements and weights." "The braza, which corresponds to the English fathom. The English nautical league and mile, English ton and short ton; occasionally the metric ton. Displacement ton as above (English). Freight per metric ton."

Grain at Wholesale: Hectare (*sic*), pound, arroba, quintal. *Meat at Wholesale:* Pound, arroba. *Root Crops at Wholesale:* Pound, kilogram, arroba, manojo, ton. *Coffee at Wholesale:* Kilogram, arroba, quintal. *Milk at Wholesale:* Contara, botella. *Butter and Cheese at Wholesale:* Pound, arroba, metric pound. *Garden Products at Wholesale:* Pound, kilogram, arroba, quintal. *Rubber at Wholesale:* Pound, arroba, quintal, metric ton.

Railway Tariff for Passengers and Freight (Load and Distance): Kilometer. *Loads and Rates for City Transportation:* Arroba, mile, pound. *Loads and Rates for Transportation by Muleback Across the Mountains:* Arroba, mile.

Railway Track Gages and Length of Lines: Inch, foot, meter, kilometer.

"The pound in this region is the English because all the machines, platform scales and weighing instruments come from England and the United States." "As you can see, we have no uniformity of weights and measures in this country." The report of Mr. W. A. Graham Clark, Commercial Agent of the Department of Commerce and Labor, Part II, published by the Department in 1910, contains the following: "An instance of the conservatism of the retail merchants in this respect was strikingly shown during the recent civil war, when the Bogota importers found it necessary to get some white goods from the Barranquilla importers. On arrival the importers found them almost unsalable because they were in the coast lengths of 20 yards instead of the customary Bogota lengths of 24 yards. It would seem that, as the goods are finally retailed by the vara, the length of cuts would be immaterial, but according to the importers it has a strong effect on the salability of the cloth, and this peculiarity must be catered to in order to obtain the business."

Colombia "adopted" the metric system in 1853.

COSTA RICA

(Summary of three returned questionnaires)

Groceries: Libra, cajuela, fanega, quintal. *Fruit:* Domestic, no standard; imported, libra. *Milk:* Liter, botella (½ gallon). *Butter and Cheese:* Libra, arroba. *Other Farm and Garden Products:* Libra, cuarillo, fanega, cajuela, quintal. *Hardware:* Pie, vara, libra, pound. *Fish:* Libra quintal. *Meat:* Kilogram, libra. *Flour:* Quintal, half quintal, libra. *Tea and Coffee:* Quintal, libra.

Dry Goods: Vara, yard.

Fuel: Coal, libra; charcoal, cuartillo; wood, no defined unit.

Ready-Made Clothing: Inch, centimeter. *Hats:* Inch. *Collars:* Inch, centimeter. *Underwear and Hosiery:* Inch, centimeter. *Shoes:* English numbers, French numbers. *Gloves:* Inch. *Corsets:* Inch.

Measurement of Land: In agricultural districts: Hectare, square vara, manzana, are. In the smaller towns: Hectare, square pie, square vara, square meter. In cities: Hectare, square pie, square vara, manzana, square meter. "The people in their transactions generally use the manzana and square vara, but the registry of documents in the government office is based entirely on the meter and the hectare."

Lumber and Timber: Lineal and cubic pie, tonelada of 27 cubic pies, ton of 1000 kilos, foot and vara for length, inch for thickness.

By Carpenters and Other Woodworkers: Superficial and cubic pie, meter, foot, vara, yard. "Indiscriminately the English foot, the Spanish vara, yard and meter." *By Tailors and Dressmakers:* Yard, vara, meter.

In Machine Shops: Quintal, libra, meter, vara, foot, yard, pound.

In Contracts for the Excavation of Ground: Tonelada, cubic meter, cubic vara, cubic foot, cubic yard, cubic meter. *In Mines and Mineral Products:* Metric ton, tonelada, ounce. *Smelting and Smelter Products:* Foot, vara, yard, meter, libra, kilogram. *Pipe Sizes:* Inch, foot.

Ship and Boat Building: Cubic ton. *Marine Measurements:* Mile, league. *Hay at Wholesale:* Bale of 30 to 50 libras. *Grain at Wholesale:* Quintal, fanega, cajeula, cuartillo. *Meat at Wholesale:* Kilogram, quintal. *Root Crops at Wholesale:* Quintal, bag of 160 liters. *Coffee at Wholesale:* Quintal, tonelada. *Milk at Wholesale:* Botella. *Butter and Cheese at Wholesale:* Quintal, arroba. *Garden Products at Wholesale:* Quintal, bag of 160 liters. *Rubber at Wholesale:* Quintal.

Railway Tariff: Passengers per mile; freight per quintal, kilo, metric ton, cubic pie, cubic ton, cubic meter per kilometer. *Urban Transportation:* Quintal. *Muleback Transportation Across Mountains:* Arroba. *Railway Gage:* Feet and inches.

"Although the law No. 35 of July 17, 1884, established the metric system as obligatory, the people and the merchants do not use it ordinarily in their transactions."

Costa Rica "adopted" the metric system in 1858.

CUBA

(Summary of three returned questionnaires)

Groceries: Libra, quintal. *Fruits:* Libra. *Milk:* Botella. *Butter and Cheese:* Libra. *Other Farm Products:* Libra. *Hardware:* "English measures." *Fish:* Libra. *Meat:* Libra. *Flour:* Libra. *Tea and Coffee:* Libra. *Dry Goods:* Vara, yard.

Fuel: Libra, cuerda.

Tobacco: Libra, quintal.

Ready-Made Clothing: Inch, "American measures." *Hats:* Centimeter, "American measures." *Collars:* Inch, centimeter. *Underwear and Hosiery:* Inch, centimeter, "American measures." *Shoes:* Centimeter, "American measures." *Gloves:* Centimeter, inch, "American measures." *Corsets:* Inch, centimeter, "American measures."

For the Measurement of Land: In the farming districts: Caballeria, leagua, carreaux, "the equivalents being inserted in all public documents according to law." In the smaller towns: Caballeria, vara, meter, cubana. In cities: "Parcels of 1000 square varas."

Lumber and Timber: Foot, inch, kilogram (*sic*).

By Carpenters and Other Woodworkers: Foot, inch, kilogram (*sic*). *By Tailors and Seamstresses:* Meter, centimeter. *By Stone and Brick Masons:* Meter, foot, inch, kilogram (*sic*).

In Machine Shops: Inch, centimeter, pound.

In Contracts for Excavation of Ground: Cubic meter. *In Mines and for Mining Products:* Ton, metric. "Transactions with the United States in feet, inches and pounds." *In Smelting and for Smelter Products:* Centimeter, inch. *Sizes of Pipe for Gas, Water, Sewers, Etc.:* Inch.

In Ship and Boat Building: Foot, inch, meter, ton. *Marine Measurements:* League, ton, mile, "foot for depth."

Hay at Wholesale: Pound, English quintal. *Grain at Wholesale:* Pound, English quintal. *Meat at Wholesale:* Pound, Spanish and English quintal. *Root Crops at Wholesale:* Pound, English quintal. *Coffee at Wholesale:* Pound, English and Spanish quintal. *Milk at Wholesale:* Botella. *Butter and Cheese at Wholesale:* Pound, English quintal. *Garden Products at Wholesale:* Pound.

Railway Tariff for Passengers and Freight (Load and Distance): Meter, kilogram, kilometer. *Loads and Rates for City Transportation:* Meter, kilogram. *Railway Track Gages and Length of Lines:* Foot, inch, kilometer. *Railway Equipment* (*units used in the construction and repairing of locomotives, cars, etc.*)*:* "American and English equipment."

"American measures generally used and in each industry the name is used that corresponds with the English meaning."

The report of Mr. W. A. Graham Clark, Commercial Agent of the Department of Commerce and Labor, Part I, published by the Department in 1909, contains the following: "Though the metric system of weights and measures is the official and legal system in Cuba, some of the Spanish weights and measures are still largely used, among them being the arroba and the vara. Cloth is bought by the importer by the meter or yard, and is retailed in the shops by the yard or the vara, the vara being more commonly used."

Cuba is one of the thirty-four countries which, according to the American Metric Association, have "adopted" the metric system.

DOMINICAN REPUBLIC

Commerce Reports, published by the Department of Commerce, prints the following communication, dated February 20, 1918, from Consul Arthur McLean of Puerto Plata: "The metric system of weights and measures has been legally adopted by the Dominican Republic. The only places, however, where the metric system is applied to trade here is in the municipal markets; avoirdupois weights are used in all other mercantile transactions, although the metric system is in force in the customs and other Government institutions. The kilometer and the league are the two units most generally used in computing distances. Jobbers use the English yard in selling cotton goods to the retailers, while the latter in turn sell to their customers by the vara or Spanish yard, measuring 33 inches. While quotations may be made by American houses to their clients in the Dominican Republic in either metric or English units, the latter are equally acceptable, if not preferred."

ECUADOR

(Summary of five returned questionnaires. One of the questionnaires, in English, reports pounds where, in view of the others, libras are probably meant and are so here reported.)

Groceries: Libra, quintal. *Milk:* Liter, gallon. *Butter and Cheese:* Libra, arroba, quintal. *Other Farm Products:* Arroba, quintal. *Hardware:* Libra, arroba, quintal; pipe by the foot, sheet iron and zinc by the pound, nails and tacks by the pound and ounce. *Fish:* Arroba, quintal. *Meat:* Libra, kilogram. *Flour:* Libra, kilogram, quintal. *Tea and Coffee:* Libra. *Dry Goods:* At retail, vara; at wholesale, yard, meter.

Tobacco: Libra, quintal.

Ready-Made Clothing: Inch. *Hats:* Centimeter. *Collars:* Centimeter. *Underwear and Hosiery:* Inch, centimeter. *Shoes:* Centimeter, English sizes. *Gloves:* Centimeter, inch. *Corsets:* Centimeter, inch.

For the Measurement of Land: In the farming districts: Hectare, cuadra, square meter. In the smaller towns: Square meter, cuadra. In cities: Square meter, vara. "In the cities the buildings are measured by the meter, the lots by the vara."

Lumber and Timber: Square foot, pie, foot, pulgada, inch, centimeter; length in varas, circumference in palmas.

By Carpenters and Other Woodworkers: Square foot, pie, pulgada, vara. *By Tailors and Seamstresses:* Centimeter.

In Machine Shops: Centimeter, millimeter, pulgada, inch, meter. "The common standard is the English inch."

In Contracts for Excavation of Ground: Square meter, cubic meter, vara. *In Mines and for Mining Products:* Kilogram, ton, tonelada, quintal. *In Smelting and for Smelter Products:* Quintal, pound, kilogram. *Sizes of Pipe for Gas, Water, Sewers, Etc.:* Inch, centimeter, meter for length,

In Ship and Boat Building: Ton, meter, vara. *Marine Measurements:* Kilometer, meter vara, league, metric ton, English ton, tonelada, mile, knot, braza, paja, malina, buey.

Hay at Wholesale: Quintal. *Grain at Wholesale:* Fanega, quintal. *Meat at Wholesale:* Kilogram. *Root Crops at Wholesale:* Kilogram, quintal. *Coffee at Wholesale:* Quintal. *Milk at Wholesale:* Gallon "of 4 liters," liter. *Butter and Cheese at Wholesale:* Libra. *Rubber at Wholesale:* Quintal, kilogram.

Railway Tariff for Passengers and Freight (Load and Distance): Kilometer. *Loads and Rates for City Transportation:* Weight, cubic pie. *Railway Track Gages and Length of Lines:* Meter, kilometer, inch. *Railway Equipment* (*units used in the construction and repairing of locomotives, coaches, etc.*): American.

"The Spanish inch, foot and ton are used as are other measures, although the metric measurements are sometimes used." "The Spanish pound is used in weighing everything." "While the metric system is legal, it is not enforced."

(Reply to a questionnaire sent out by Mr. Henry R. Towne)

Legal Standards: Metric system used by the Government.

Common Standards: The public uses generally the old Spanish (Castilian) measures, the vara, the libra, and the gallon.

Commercial Use: Metric system used in business with foreign countries except the United States and Great Britain, in which case the British system is used. In domestic business only the Spanish system is used.

Domestic Use: Only the Spanish system in domestic use.

Measuring Implements: Spanish measures chiefly.

Dual Standards: The old Spanish (Castilian) is preferred simply as a matter of habit "handed down by the Conquistadors."

Adoption of Metric System: Metric system adopted about 30 years ago.

Bookkeeping, Invoicing, Etc.: Bookkeeping about half in metric and half in old Spanish units, but only the latter used in making out domestic invoices. Foreign invoices about 90 per cent metric and 10 per cent old Spanish. Business records about half and half.

The report of Mr. W. A. Graham Clark, Commercial Agent of the Department of Commerce and Labor, Part IV, published by the Department in 1911, contains the following: "Cloth is bought and sold by the importer by the yard, meter or vara, but is always retailed by the vara."

Ecuador "adopted" the metric system in 1856.

GUATEMALA

(Summary of four returned questionnaires)

Groceries: Libra, quintal. *Milk:* Liter. *Butter and Cheese:* Libra. *Fish:* Libra. *Meat:* Libra. *Flour:* Libra, quintal. *Tea and Coffee:* Libra.

Dry Goods: Vara.

Fuel: Carga, red.

Tobacco: Libra.

Ready-Made Clothing: Inch. *Hats:* Inch, centimeter. "The two standards are used indifferently." *Collars:* Inch, centimeter. "The two standards are used indifferently." *Underwear and Hosiery:* Inch. *Shoes:* English sizes, French sizes.

Gloves: Inch. *Corsets:* Inch. "The importers usually sell all cloths, that is to say, men's cloths, by the yard. The retailers often and almost solely use the vara. The meter is used very little and for the most part only between importers and buyers at wholesale."

Measurement of Land: In agricultural districts: Caballeria, manzana, cuerda, fanega, almud. In smaller towns: Cuerda. In cities: Square vara.

Lumber and Timber: Foot and inch.

By Carpenters and Other Woodworkers: Foot and inch. *By Stone and Brick Masons:* Cubic yard, square vara, cuadrada. *By Tailors and Seamstresses:* Yard, vara.

In Blacksmith Shops: Libra, vara, meter. *In Machine Shops:* Foot and inch.

In Contracts for the Excavation of Ground: Cubic pie, cubic yard. *Mining and Mine Products:* English ton of 2000 lb. *Sizes of Pipe:* Inch.

Grain at Wholesale: Libra, quintal, fanega. *Meat at Wholesale:* Libra, arroba. *Root Crops at Wholesale:* Libra, quintal. *Coffee at Wholesale:* Libra, quintal. *Milk at Wholesale:* Liter, botella. *Butter and Cheese at Wholesale:* Libra. *Rubber at Wholesale:* Libra, quintal.

Railway Tariff: Passengers per mile, freight per pound per mile. *Urban Trucking:* Mile. *Railway Track Gage:* 3 ft.

"The artisans of the country use in their calculations the Spanish vara as the standard. Foreigners use the yard or the meter indifferently, but the lumber dealer and the dealer in logs sell by thousands of square feet (English)."

(Reply to a Questionnaire sent out by Mr. Henry R. Towne)

Legal Standards: Metric.

Common Standards: Chiefly the old units. The people generally use the Spanish vara, the cuarta, and the libra.

Commercial Use: Metric system generally used in business.

Domestic Use: In domestic life the old Spanish measures are generally used.

Measuring Implements: Weighing scales are sold marked on one side in libras and on the other side in kilograms. Measures of length are marked on one side with the cuarta and on the other with the meter. Measures of volume comprise only the liter and the vara or cubic meter.

Dual Standards: The people continue to use the old Spanish measures from habit and because they know them better than the others.

Adoption of Metric System: The metric system was adopted here more than twenty years ago, when the Republic was established.

Bookkeeping, Invoicing, Etc.: The vara and the meter or yard are used indifferently.

"Our standard of weight is the quintal of 100 Spanish pounds. Our standard of measure is the botella."

According to the Report to the International High Commission on the Metric System in Export Trade prepared by the Director of the Bureau of Standards, the metric system is "obligatory" in Guatemala.

Guatemala "adopted" the metric system in 1894.

HAITI

Factors in Foreign Trade, published by the Department of Commerce and Labor, 1912, gives the following information:

"*Weights and Measures:* Metric system, but pounds, tons and gallons are generally used in commerce and statistics. The pound of 500 grams (1.1023 pounds avoirdupois) is adopted in the customs; the ton is 2000 pounds; gallon is equivalent to United States gallon."

MEXICO

(Summary of ten returned questionnaires)

Groceries: Kilogram. *Fruits:* Kilogram. *Milk:* Liter, cuartillo. *Butter and Cheese:* Kilogram, pound. *Other Farm Products:* Kilogram, metric ton, arroba, carga, cuartillo. *Hardware:* Kilogram, meter, "as in U. S." *Fish:* Kilogram. *Meat:* Kilogram. *Flour:* Kilogram, arroba, carga. *Tea and Coffee:* Kilogram, libra, pound.

Dry Goods: Kilogram (*sic*), meter, centimeter, vara, yard.

Fuel: Kilogram, cord, quintal, metric ton, troje, zontla.

Tobacco: Kilogram.

Ready-Made Clothing: Meter, yard, inch, centimeter, kilo (*sic*). "French and American indiscriminately." "As in U. S." *Hats:* Meter (*sic*), yard (*sic*), inch, centimeter. "French or American indiscriminately." "As in U. S." *Underwear and Hosiery:* Meter (*sic*), yard (*sic*), inch, centimeter. "French or American indiscriminately." "As in U. S."

Shoes: Meter (*sic*), yard (*sic*), centimeter, English sizes. "French or American indiscriminately." "As in U. S." *Corsets:* Meter (*sic*), yard (*sic*), centimeter, inch. "French or American indiscriminately." "As in U. S." *Gloves:* Meter (*sic*), yard (*sic*), inch, centimeter. "French or American indiscriminately." "As in U. S." "If material is from France, the meter; if from the United States, the yard."

For the Measurement of Land: In the farming districts: Hectoliter (*sic*), liter (*sic*), hectare, sitio, caballeria, acre, kilometer. In the smaller towns: Hectoliter (*sic*), liter (*sic*), hectare, square meter, acre, kilometer. In cities: Hectoliter (*sic*), liter (*sic*), hectare, meter, square meter, acre, kilometer.

Lumber and Timber: Foot, inch, cubic foot, meter, centimeter, pulgada, pie, kilogram (*sic*).

By Carpenters and Other Woodworkers: Foot, inch, meter, centimeter, pulgada, pie. *By Tailors and Seamstresses:* Meter, centimeter, vara. *By Blacksmiths:* Metric. *By Stone and Brick Masons:* Foot, inch, meter, square meter, kilogram, centimeter.

In Machine Shops: Inch, kilogram, meter, centimeter.

In Contracts for Excavation of Ground: Cubic meter, square meter, meter. *In Mines and for Mining Products:* Cubic yard, metric ton, square meter, kilogram, onza, meter. *In Smelting and for Smelter Products:* Foot, meter, metric ton. *Sizes of Pipes for Gas, Water, Sewers, Etc.:* Foot, inch, meter, centimeter.

In Ship and Boat Building: Meter, foot, kilogram. *Marine Measurements:* League, nautical mile, cubic meter, metric ton.

Hay at Wholesale: Kilogram, ton, arroba, metric ton. *Grain at Wholesale:* Quintal, kilogram, hectoliter, carga, cuartillo. *Meat at Wholesale:* Kilogram. *Root Crops at Wholesale:* Kilogram, quintal. *Coffee at Wholesale:* Quintal, kilogram. *Milk at Wholesale:* Liter, cuartillo, gallon. *Butter and Cheese at Wholesale:* Kilogram, pound (probably libra). *Garden Products at Wholesale:* Kilogram, quintal. *Rubber at Wholesale:* Pound (probably libra), kilogram.

Railway Tariff for Passengers and Freight (Load and Distance): Kilogram, kilometer, metric ton, cubic meter, mile, ton. *Loads and Rates for City Transportation:* Kilogram, kilometer, carga. *Loads and Rates for Transportation by Muleback Across the Mountains:* Carga, arroba, kilogram, kilometer. "The old weight (1 carga = 300 libras) still holds its own when dealing with muleback transportation." *Railway Track Gages and Length of Lines:* Kilometer, centimeter, foot, inch. *Railway Equipment (units used in the construction and repairing of locomotives, coaches, etc.):* Foot, inch, metric kilogram (*sic*). "As in U. S." "All transportation here is done by boat on a long-ton basis."

"In many cases the Spanish weights are used." "In many cases the libra and vara are used."

According to the Report to the International High Commission of the Metric System in Export Trade prepared by the Director of the Bureau of Standards, the metric system is "obligatory" in Mexico.

Mexico "adopted" the metric system in 1862.

NICARAGUA

(Summary of three returned questionnaires)

Groceries: Libra, kilogram. *Milk:* Liter, gallon, botella (1/5 gallon). *Butter and Cheese:* Libra, arroba. *Other Farm Products:* Libra, quintal, fanega. *Hardware:* Libra, kilogram. *Fish:* Libra. *Meat:* Libra. *Flour:* Libra, kilogram. *Tea and Coffee:* Libra, quintal.

Dry Goods: Vara, yard, meter.

Fuel: Libra, corcada, marco, cordal, cuartillo.

Tobacco: Libra.

Ready-Made Clothing: Inch, centimeter. *Hats:* "English and metric system." *Collars:* "English and metric system." *Underwear and Hosiery:* "English and metric system." *Shoes:* Centimeter. *Gloves:* "The measure of the country of origin." *Corsets:* "The measure of the country of origin."

For the Measurement of Land: In the farming districts: Manzana, hectare, vara, meter. In the smaller towns: Manzana, hectare, vara, meter. In cities: Manzana, vara, cuadra, meter.

Lumber and Timber: Vara, pulgada.

By Carpenters and Other Woodworkers: Vara, pulgada, tonelada (*sic*). *By Stone and Brick Masons:* Vara, pulgada, tonelada (*sic*). *By Tailors and Seamstresses:* Vara, centimeter, yard, meter.

In Machine Shops: Inch, centimeter, vara.

In Contracts for Excavation of Ground: Vara. *In Mines and for Mining Products:* "English system," tonelada. *In Smelting and for Smelter Products:* "English system." *Sizes of Pipe for Gas, Water, Sewers, Etc.:* Inch, pulgada.

Grain at Wholesale: Libra, fanega. *Meat at Wholesale:* Arroba, libra, kilogram. *Root Crops at Wholesale:* Quintal. *Coffee at Wholesale:* Libra, quintal. *Milk at Wholesale:* "Cantaro, of about 5 gallons." *Butter and Cheese at Wholesale:* Libra, kilogram. *Rubber at Wholesale:* Libra, quintal.

Railway Tariff for Passengers and Freight (Load and Distance): Kilogram, kilometer. *Loads and Rates for City Transportation:* Kilogram. *Loads and Rates for Transportation by Muleback Across the Mountains:* Libra. *Railway Track Gages and Length of Lines:* Gage, foot, inch; length, kilometer. *Railway Equipment* (*units used in the construction and repairing of locomotives, cars, etc.*): "All American."

"The metric system of weights and measures is the official and lawful system of the Republic, but owing to the preponderance of trade with the United States, the influences of the system obtaining there are felt in all commercial transactions." "The introduction of all imports is, however, based on the kilo, but throughout the Republic articles are retailed by the libra. Liquids when imported are measured by the liter, yet the American gallon or quart is commonly known. Distances are computed in kilometers, but the yard of 36 inches is used almost as much as the vara of 33 inches or the meter of 39.37 inches. So it might be said that the English system is almost as common as the metric."

The report of Mr. W. A. Graham Clark, Commercial Agent of the Department of Commerce and Labor, Part I, published by the Department in 1909, contains the following: The 24-inch manta retails at 40 centavos a vara. The turkey-red shirting is mainly from England, retailing at 80 centavos a vara. The usual price of a 24-inch print is 60 centavos a vara."

According to the Report to the International High Commission on the Metric System in Export Trade prepared by the Director of the Bureau of Standards, the metric system is "obligatory" in Nicaragua.

Nicaragua is one of the thirty-four countries which, according to the American Metric Association, have "adopted" the metric system.

PANAMA

(Summary of five returned questionnaires. In view of the quotation below, libra has been uniformly interpreted as pound)

Groceries: Pound, ounce. *Fruits:* Pound, ounce. *Milk:* Quart, botella. *Butter and Cheese:* Pound, ounce. *Other Farm Products:* Pound, English quintal. *Hardware:* Pound,

English quintal. *Fish:* Pound, English quintal. *Meat:* Pound, English quintal. *Flour:* Pound English quintal, "barrel of 196 pounds." *Tea and Coffee:* Pound, ounce, English quintal.

Dry Goods: Yard, vara. *Fuel:* Long ton, short ton, English quintal, cord.

Tobacco: Pound, ounce, English quintal.

Ready-Made Clothing: Hats: Collars: Underwear and Hosiery: Shoes: Gloves: Corsets: Inch, metric. "The articles mentioned are imported almost exclusively from the United States and the measures are the same as in that country." "A few French articles are metric sizes."

For the Measurement of Land: In the farming districts: Hectare, square meter. In the smaller towns: Hectare, square meter. In cities: Square meter.

Lumber and Timber: Inch, foot, square and cubic foot.

By Carpenters and Other Woodworkers: Inch, "some centimeters." *By Stone and Brick Masons:* Inch, centimeter, "American generally." *By Tailors and Dressmakers:* Yard, inch, centimeter, "American generally."

In Machine Shops: Inch, centimeter, pound, English quintal.

In Contracts for Excavation of Ground: Cubic meter, yard. *Sizes of Pipe for Gas, Water, Sewers, Etc.:* Inch.

In Ship and Boat Building: Inch, centimeter. *Marine Measurement:* Short ton, ton of 40 cu. ft., marine mile.

Hay at Wholesale: Pound. *Grain at Wholesale:* Pound, English quintal. *Meat at Wholesale:* Pound, English quintal. *Root Crops at Wholesale:* Pound. *Coffee at Wholesale:* Pound, English quintal. *Milk at Wholesale:* Quart, botella, gallon. *Butter and Cheese at Wholesale:* Pound. *Garden Products at Wholesale:* Pound, English quintal. *Rubber at Wholesale:* Pound.

Railway Tariff for Passengers and Freight (Load and Distance): Mile, pound, cubic foot, *Loads and Rates for City Transportation:* Pound. *Railway Track Gages and Length of Lines:* Inch, mile. *Railway Equipment* (*units used in the construction and repairing of locomotives, cars, etc.*): Inch.

"The Spanish units are never used here and while the metric system is the official standard for the country, with the exception of lands, it is seldom used in Panama, American (English) standards of weight and measure being in universal use."

Panama "adopted" the metric system in 1857.

PERU

(Summary of seven returned questionnaires)

Groceries: Kilogram. *Milk:* Liter, botella of 0.75 liter. *Butter and Cheese:* Libra, kilogram. *Other Farm Products:* Libra, kilogram. *Hardware:* Libra, pie. *Fish:* Kilogram, libra. *Meat:* Kilogram, libra. *Flour:* Kilogram, libra. *Tea and Coffee:* Kilogram, libra.

Dry Goods: Meter, vara.

Fuel: Kilogram, quintal, libra.

Tobacco: Kilogram. (Government monopoly.)

Ready-Made Clothing: Centimeter. *Hats:* Centimeter, "English numbers." *Collars:* Centimeter. *Underwear and Hosiery:* Centimeter, "Special measure." *Shoes:* Centimeter, "Special measure." *Gloves:* Centimeter, "Special measure." *Corsets:* Centimeter.

For the Measurement of Land: In the farming districts: Fanegada, topo, cuadra, square vara; "Sale and registry by the fanegada." In the smaller towns: Square meter, fanegada, topo, cuadra; "Sale and registry by the fanegada." In cities: Square meter, square vara, fanegada. "Sale and registry by the fanegada."

Lumber and Timber: Foot, inch, square foot; "Spanish foot for cedar."

By Carpenters and Other Woodworkers: Foot, inch, square foot, meter, "English system." *By Stone and Brick Masons:* Meter, square meter, arroba. *By Tailors and Seamstresses:* Centimeter, meter, yard.

In Machine Shops: Meter, inch, foot, quintal. "English system chiefly. A few jobs for European-built machinery are handled on the metric system."

In Contracts for Excavation of Ground: Cubic meter. *In Mines and for Mining Products:* Tonelada, metric ton, cubic meter, gallon of 3 3/4 liters for petroleum products. "Marco, a weight per cajon of 12,000 marcos. Troy ounces per ton. Grams per metric ton." "Spanish, English and metric. *In Smelting and for Smelter Products:* Kilogram, libra, foot. "The same as mining." *Sizes of Pipe for Gas, Water, Sewers, Etc.:* Meter, foot, inch, "Generally English feet and inches and their fractions."

In Ship and Boat Building: Meter, foot, inch, kilogram, registered ton. "Generally the English measures." *Marine Measurements:* Mile, ton, cubic meter, knot, braza (fathom of 6 English feet), metric ton. "Generally the English measures."

Hay at Wholesale: Quintal, metric quintal. *Grain at Wholesale:* Quintal, fanega, metric quintal. *Meat at Wholesale:* Kilogram, metric quintal, libra. *Root Crops at Wholesale:* Quintal, metric quintal, libra. *Coffee at Wholesale:* Quintal, libra. *Milk at Wholesale:* Liter. *Butter and Cheese at Wholesale:* Quintal, kilogram, libra. *Garden Products at Wholesale:* Arroba. *Rubber at Wholesale:* Tonelada, kilogram, quintal.

Railway Tariff for Passengers and Freight (Load and Distance): Kilometer, quintal, metric ton, cubic meter. *Loads and Rates for City Transportation:* Metric ton, kilogram. *Loads and Rates for Transportation by Muleback Across the Mountains:* Quintal, per kilometer. *Railway Track Gages and Length of Lines:* Meter, kilometer. *Railway Equipment* (*units used in the construction and repairing of locomotives, cars, etc.*): Meter, foot, inch, tonelada, kilogram.

"At the present time there are many who buy and sell, using other measures which are not metric decimal." "The metric system is the legal system in Peru but the other measures named have not yet been banished."

Commerce Reports for April 29, 1918, contains a report from Commercial Attaché W. F. Montavon, of Lima, in which are given particulars of new Peruvian exports duties. The new rates provide for a duty on copper bars per *short ton*, and on sugar, cotton and wool per *Spanish quintal.* Italicized words are verbatim from the report.

The report of Mr. W. A. Graham Clark, Commercial Agent of the Department of Commerce and Labor, Part IV, published by the Department in 1911, contains the following: "The Peruvian importers buy cotton goods by the yard, the meter, or the vara. . . . Although the country has officially adopted the metric system, cloth is always retailed by the vara."

Peru "adopted" the metric system in 1862.

PORTO RICO

In 1913, Mr. F. S. Holbrook, Associate Physicist at the Bureau of Standards, went to Porto Rico as the representative of the Bureau to coöperate with the local legislature in connection with weights and measures legislation. Mr. Holbrook's report of his investigations contains the following: "This, then, was the condition of affairs when the work was commenced: The kilogram, the United States pound and the Spanish libra or pound for weight; the liter, the quart, the cuartillo for liquid measure; the meter, the yard and the vara for length measure; the hectare, the acre and cuerda for land measure, were all in use side by side. A little over 50 per cent of the weights found in use were of the Spanish system, the remainder being about equally divided between weights of the metric system and of our customary system. Of the liquid measures tested, the very great majority were cuartillos or subdivisions thereof,"

As the outgrowth of Mr. Holbrook's visit to Porto Rico the weights and measures of the United States, with the exception of the bushel and its subdivisions, were placed "upon an equal basis" with the metric units, the result being shown in the following reply to a questionnaire sent out by Mr. Henry R. Towne.

Legal Standards: Metric, U. S., and a few Spanish.

Common Standards: Metric, U. S., and some Spanish.

Railroad Distances: Kilometers.

Weights: Generally pounds, but also kilos.

Volume: Liter, Spanish quart, but generally U. S. quart.

Land: Spanish cuerda and metric hectare, the latter in deeds.

Cubic Meter: Used in public contracts.

Commercial Use: Commercial transactions on U. S. basis; Government transactions on metric basis.

Domestic Use: U. S. standards in common use and are legal. Metric catalogs of no use.

Measuring Implements: Both U. S. and metric in common use.

Dual Standards: Old Spanish measures generally displaced by U. S. measures, except the "cuerda" for land records. Metric system also legal; chiefly used in Government transactions.

Adoption of Metric System: By Spanish Government in early 90's. By local legislature in 1898. U. S. Standards also legalized since latter date.

Bookkeeping, Invoicing, Etc.: U. S. Standards used almost exclusively.

The William J. Dines, Jr., Co. write: "I have been with engineers and workmen in all parts of the Island, and very seldom find anyone using anything but the American standard."

The report of Mr. Wm. A. Graham Clark, Commercial Agent of the Department of Commerce and Labor, Part IV, published by the Department in 1911, contains the following: "In

San Juan most goods are retailed by the yard as the people there demand this length, but in the remainder of the island the usual measure is the Spanish vara of 83.6 centimeters."

All of the above should be compared with the statement by Mr. Fred R. Drake as quoted in the preamble.

SAN SALVADOR

(Summary of one returned questionnaire)

Groceries: Almud. *Milk:* Liter. *Butter and Cheese:* Libra. *Other Form Products:* Libra. *Hardware:* Pound, quintal. *Fish:* Libra. *Meat:* Libra. *Flour:* Bulto. *Tea and Coffee:* Libra.

Dry Goods: Vara.

Fuel: Carga.

Collars: English numbers.

For the Measurement of Land: In the farming districts; Manzana, caballeria. In the smaller towns: Vara, "with metric measures always used in the documents." In cities: Meter and millimeter (*sic*).

By Stone and Brick Masons: Vara, pie, pulgada. *By Tailors and Seamstresses:* Vara, meter, millimeter.

In Contracts for Excavation of Ground: Cubic meter. *Sizes of Pipe for Gas, Water, Sewers, Etc.:* Inch.

Grain at Wholesale: Fanega, arroba. *Meat at Wholesale:* Libra. *Coffee at Wholesale:* Quintal. *Milk at Wholesale:* Botella. *Butter and Cheese at Wholesale:* Libra.

Railway Tariff for Passengers and Feight (Load and Distance): Cubic foot, quintal, kilometer. *Loads and Rates for City Transportation:* Quintal. *Loads and Rates for Transportation by Muleback Across the Mountains:* Arroba.

The report of Mr. W. A. Graham Clark, Commercial Agent of the Department of Commerce and Labor, Part I, published by the Department in 1909, contains the following: "Practically all exported yarn is put up in either five- or ten-pound paper-covered packets and either eighty or forty of these packed to the bale. Yarn is retailed here in ten-pound lots, but two five-pound packets are preferred to one ten-pound. . . . These splits are 20 to 26 inches wide, and retail at a real a vara."

SPANISH HONDURAS

(Summary of three returned questionnaires)

Groceries: Pound, arroba. *Fruits:* Pound. *Milk:* Liter, bottella, pint. *Butter and Cheese*: Libra, pound. *Other Farm Products:* Pound. *Hardware:* Pound. *Fish:* Libra, pound. *Meat:* Libra, pound. *Flour:* Libra, pound. *Tea and Coffee:* Libra, pound.

Dry Goods: Vara, yard.

Fuel: Carga, pound, cuerda.

Tobacco: Libra, pound.

Ready-Made Clothing: Inch, "Same as in United States." *Hats:* "American and French sizes." *Collars:* "American and French sizes." *Underwear and Hosiery:* "American and French sizes." *Shoes:* "American and French sizes." *Gloves:* "American and French sizes." *Corsets:* "American and French sizes." "General American sizes of wearing apparel in use."

For the Measurement of Land: In the farming districts: Caballeria, manzana, hectare. In the smaller towns: Caballeria, manzana, hectare, foot. In cities: Caballeria, manzana, hectare, foot. "The official standard is the hectare. Deeds in hectares and others in manzanas according to original measure. In towns the lots are measured in English feet and are so registered. Also large parcels in the country measured in caballerias."

Lumber and Timber: Laufenberg rule, "Exactly the same as American sizes."

By Carpenters and Other Woodworkers: Foot, inch. *By Stone and Brick Masons:* Inch, "American sizes." *By Tailors and Seamstresses:* Metric, foot.

In Machine Shops: Inch, foot, pound, "American sizes."

In Contracts for Excavation of Ground: Foot, inch, "American sizes." *In Mines and for Mining Products:* Cubic foot, ton, metric ton, "American sizes." *In Smelting and for Smelter Products:* Pound, ton, "American sizes." *Sizes of Pipe for Gas, Water, Sewers, etc.:* "Generally American sizes."

In Ship and Boat Building: "Same as in United States." *Marine Measurements:* Foot, "American sizes."

Hay at Wholesale: Libra. *Grain at Wholesale:* Carga, libra, medida. *Meat at Wholesale:* Libra, pound. *Root Crops at Wholesale:* Pound. *Coffee at Wholesale:* Carga, libra. *Milk at Wholesale:* Liter. *Butter and Cheese at Wholesale:* English arroba, libriado. *Garden Products at Wholesale:* Libra, pound. *Rubber at Wholesale:* Pound, libra, quintal.

Railway Tariff for Passengers and Freight (Load and Distance): Kilogram, kilometer, mile. *Loads and Rates for Transportation by Muleback Across the Mountains:* Arroba, pound. *Railway Track Gages and Length of Lines:* Foot, inch, kilometer. *Railway Equipment* (*units used in the construction and repairing of locomotives, cars, etc.*): "English units used in repairs."

"The English yard is chiefly used in the larger and better stores. The vara is used frequently in smaller stores selling at retail to certain classes, but the people are accustomed to and demand the English yard." "All articles not named above are valued according to agreement per arroba or carga, always keeping the English as the standard. The arroba is 25 pounds and the carga is 8 arrobas or 200 pounds."

The report of Mr. W. A. Graham Clark, Commercial Agent of the Department of Commerce and Labor, Part I, published by the Department in 1909, contains the following: "The importers sell to the retailers by the yard and the retailers sell at practically the same price by the vara . . . This country has officially tried to adopt the metric system, but the natives cling to the vara and the arroba as their measures of length and weight."

Honduras is one of the thirty-four countries which, according to the American Metric Association, have "adopted" the metric system.

URUGUAY

(Summary of four returned questionnaires)

Groceries: Kilogram. *Milk:* Liter. *Butter and Cheese:* Kilogram. *Other Farm Products:* Kilogram. *Hardware:* Kilogram, meter. *Meat:* Kilogram. *Flour:* Kilogram. *Tea and Coffee:* Kilogram.

Dry Goods: Meter.

Fuel: Metric ton.

Tobacco: Kilogram.

Ready-Made Clothing: Centimeter. *Hats.* Centimeter, English numbers. *Collars:* Centimeter. *Underwear and Hosiery:* Meter, centimeter, inch. *Gloves:* "As in North America." "Universal numbering." *Corsets:* Centimeter.

For the Measurement of Land: In the farming districts: Hectare. "The cuadra is still commonly used but is prohibited in the documents." In the smaller towns: Hectare, square meter. In cities: Hectare, square meter.

Lumber and Timber: Meter, centimeter, foot, inch. "Officially the meter, customarily per thousand feet."

By Carpenters and Other Woodworkers: Meter, centimeter, English foot, inch. "English foot and inch generally used." *By Tailors and Seamstresses:* Centimeter, kilo (*sic*), English measures. *By Stone and Brick Masons:* Kilogram, meter, metric ton.

In Machine Shops: Kilogram. "Officially the meter and sub-multiples, practically, following the custom, the English inch." "English measures generally."

In Contracts for Excavation of Ground: Cubic meter, meter. *In Mines and for Mining Products:* Kilogram, cubic meter. *In Smelting and for Smelter Products:* Kilogram, metric ton. *Sizes of Pipe for Gas, Water, Sewers, Etc.:* "English measures, but in official and public documents these are reduced to centimeters." "Officially the meter, practically the pulgada."

In Ship and Boat Building: Metric. *Marine Measurements:* Mile, knot, foot, cable, ton, meter for sounding, braza, "but in official and public documents only the decimal measures appear." "Officially the kilometer; to a large extent the marine mile." "In practice there is no effort to abolish completely the English measures."

Hay at Wholesale: Kilogram, metric quintal. *Grain at Wholesale:* Kilogram, metric quintal. *Meat at Wholesale:* Kilogram. *Root Crops at Wholesale:* Metric quintal. *Coffee at Wholesale:* Kilogram, metric quintal. *Milk at Wholesale:* Liter, hectoliter. *Butter and Cheese at Wholesale:* Kilogram. *Rubber at Wholesale:* Kilogram.

Railway Tariff for Passengers and Freight (Load and Distance): Kilogram, kilometer. Rail *way Track Gages and Length of Lines:* Metric.

"The metric system only has been used in Uruguay for at least fifty years and any one who uses any other system runs the risk of fine and imprisonment. . . . In the case of land measurement, a few old Spanish measures are authorized. This letter, according to the laws of Uruguay, must be copied in a letter-press book. Each page of the letter-press book is signed by one of the judges of the Commerce Court and may at any time be required in Court. By using in our correspondence copied in the letter-press book any terms of weights and measures not recognized by

law, we run the risk of punishment." "The introduction of the new system proved, however, a difficult and tedious process."

Uruguay "adopted" the metric system in 1862.

VENEZUELA

(Summary of five returned questionnaires)

Groceries: Libra, kilogram. *Fruits:* Kilogram, Libra. *Milk:* "Jar of 27 botellas," liter. *Butter and Cheese:* Libra, kilogram. *Other Farm Products:* Libra, metric. *Hardware:* Libra, metric. *Fish:* Libra, kilogram. *Meat:* Libra, kilogram. *Flour:* Libra, kilogram, arroba. *Tea and Coffee:* Libra, kilogram.

Dry Goods: Vara, meter, yard.

Fuel: Tonelada, metric ton.

Tobacco: Metric.

Ready-Made Clothing: Inch, centimeter. *Hats:* Centimeter, inch. *Collars:* Centimeter, inch. *Underwear and Hosiery:* Centimeter, inch. *Shoes:* Centimeter, American numbers, "An arbitrary measure equal to about 3/4 of a centimeter." *Gloves:* French numbers, American numbers. *Corsets:* Centimeter, inch. "The measures of the country from which the goods are imported are used."

For the Measurement of Land: Hectare, square kilometer, square league, sugar land in bablon (= 0.7 hectare), square meter.

Lumber and Timber: Square pie, metric.

By Carpenters and Other Woodworkers: Square pie, metric. "Some carpenters do actually work in English inches." *By Tailors and Seamstresses:* Centimeter, vara, yard, meter. *By Stone and Brick Masons:* Metric, fanega.

In Machine Shops: Libra, foot, metric.

In Contracts for Excavation of Ground: Metric. *In Mines and for Mining Products:* Metric. *In Smelting and for Smelter Products:* Metric. *Sizes of Pipe for Gas, Water, Sewers, Etc.:* Inch, metric.

In Ship and Boat Building: Metric, English. *Marine Measurements:* Metric English. "In navigation and geography miles are used; for the rest, metric."

Hay at Wholesale: Metric. *Grain at Wholesale:* Kilogram, metric quintal, fanega. *Meat at Wholesale:* Arroba, metric. *Root Crops at Wholesale:* Metric. *Coffee at Wholesale:* Metric quintal. *Milk, Butter and Cheese at Wholesale:* Metric.

Railway Tariff for Passengers and Freight (Load and Distance): Metric quintal, tonelada, kilometer, cubic meter. *Loads and Rates for City Transportation:* Metric quintal, kilogram. *Loads and Rates for Transportation by Muleback Across the Mountains:* Metric quintal. *Railway Track Gages and Length of Lines:* Meter, kilometer. *Railway Equipment (units used in the construction and repairing of locomotives, cars, etc.):* "Inches on English lines; metric] units on German railway."

"Not only is it illegal to use any other weights and measures [than those of the metric system], but a merchant is subject to punishment even for having them in his possession. The importation of weights and measures other than the legal is also prohibited and as the authorities have destroyed the old ones whereever possible distinct progress toward the universal adoption of the new system has been made. In spite of the stringency of the laws the people at large, especially in the country, still cling to the old units in their every-day life and talk and think in terms of them."

"The people in the interior of the country are not at all accustomed to the metric system and always use the old system."

Venezuela "adopted" the metric system in 1857.

APPENDIX 2

FORM LETTER WHICH ACCOMPANIED THE QUESTIONNAIRES

My Dear Sir:

The American Institute of Weights and Measures, which is composed of many of the leading engineers and manufacturers of this country, is engaged in an extended investigation of the subject of weights and measures, and it desires to obtain at first hand definite information regarding the units of weight and measure (Spanish, metric, and English) as applied to the trade, commerce and industry of South and Central America. With this in view, the accompanying list of questions has been drawn up to which we ask you to kindly reply for your locality.

The thorough character of the investigation which this Institute is undertaking will, we hope, impress you with the importance of this questionnaire, since, when all the replies are assembled, they will constitute a mass of information which is not now in existence.

It is particularly desired that answers shall be forthcoming from the smaller towns of the interior as well as from the principal cities of Latin America AND FROM INDUSTRIES AS WELL AS COMMERCE in order that the usage of weights and measures among the people may be learned. To this end we ask you to kindly make inquiry among contractors, builders, manufacturers, and, if necessary, among artisans.

Please distinguish carefully, when necessary, between the metric and English tons, between the half-kilogram and the Spanish and English pounds, the Spanish and metric quintals, and the Spanish pulgada and the English inch. When two or more units are used for the same purpose, please name them in the order of their frequency. When one unit is chiefly used, please place after it the word "Chiefly" and similarly, when one of the units is used but seldom, kindly place after it the word "Infrequent."

Your reply, esteemed sir, will place us under lasting obligations which we trust we will at some future time have the pleasure and satisfaction of discharging. In the meantime, we beg to subscribe ourselves with every consideration of respect and esteem,

Most cordially yours,

AMERICAN INSTITUTE OF WEIGHTS AND MEASURES,

..... *Commissioner.*

QUESTIONNAIRE NO. 1

What are the units of weight and measure commonly used with relation to the buying and selling at retail of the following products?

Groceries
Fruits
Milk, butter and cheese
Other farm products
Hardware
Fish
Meat
Flour
Tea and coffee
Dry goods
Fuel
Tobacco
Miscellaneous

QUESTIONNAIRE NO. 2

What are the units of measure commonly used with relation to buying and selling articles of clothing, as follows?

Ready-made clothing
Hats
Collars
Underwear and hosiery
Shoes
Gloves
Corsets
Miscellaneous

QUESTIONNAIRE NO. 3

What are the units of measure commonly used with relation to the sale of lands and filing of papers and deeds, as follows?

In the farming districts
In the smaller towns
In the cities

QUESTIONNAIRE NO. 4

What are the units of weight and measure commonly used in the following industries?

Lumber and timber (length and thickness of boards and sizes of timbers)
By carpenters and other woodworkers
By tailors and seamstresses
By blacksmiths
In machine shops
In contracts for excavation of ground
In mines and for mineral products
In smelting and for smelter products
Sizes of pipes for gas, water, sewers, etc.
In ship and boat building
Marine measurements (distances, maps, charts, tonnage, drafts, freight rates, etc.)
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QUESTIONNAIRE NO. 5

What are the units of weight and measure commonly used with relation to the buying and selling of farm products at wholesale, as follows?

Hay
Grain
Meat
Root crops
Coffee
Milk, butter and cheese
Garden products
Rubber
Miscellaneous

QUESTIONNAIRE NO. 6

What are the units of weight and measure commonly used with relation to transportation tariffs?

Railway tariff for passengers and freight (load and distance)
Loads and rates for city transportation
Loads and rates for transportation by muleback across the mountains
Railway track gages and length of lines
Railway equipment (units used in the construction and repairing of locomotives, cars, etc.)

The Hill Publishing Company's questionnaire was considerably abbreviated from the above.

LISTS OF FIRMS AND INDIVIDUALS WHO HAVE SUPPLIED THE RETURNED QUESTIONNAIRES

ARGENTINA

National City Bank Branch ..... Buenos Aires
E. Resentry (?) ..... Rosario
D. Meyer & Cia. ..... Bahia Blanca
Ramose Abilla ..... Vircuman
Santiago Egli ..... Mendoza
Donald Campbell ..... E. Carbo Entre Rios
W. Sidwell ..... Posadas
Allan B. Lea ..... Buenos Aires
Ensor H. Blanchard ..... San Isidro
Minister of Agriculture .....
Louis Dannerald ..... Mendoza

BRAZIL

Pramca y Martines ..... Sao Paulo
A. Haas ..... B. Huyinte
Ohliger & Co. ..... Manaos
Banco do Natal ..... Natal
David Cameiro & Cc. ..... Coritiba
Banco Hsp. e Agricola ..... Bello Horizonte
Fas Scrapa & Fichos .....
Tancredo Porte & Co. ..... Manaos

M. F. Do Monte & Co. ..... Mossoro
National City Bank Branch ..... Santos
Banco Commercio de P A ..... Rio Grande
Salgado Rogers & Co. ..... Ceara
Berringer & Co. ..... Para
Companhia Mogyana ..... Campinas
Bernardo A de F Hermanos ..... Goyas
Luiz Baptista Jr. ..... Sao Paulo
Jose Henriques Duarte ..... Sao Paulo
Armando Annes & Co. ..... Passo Fundo
J. B. Stewart, American Vice-Consul ..... Pernambuco
Director of the Estrada de Ferro Central de Brazil .....
Montesth & Co. ..... Pernambuco
Theodore Sampaio ..... Bahia
Dr. Francisco Texeira de Silva Tilles ..... Santos
American Consulate ..... Para
J. P. Ferras ..... Sao Paulo
Luiz Barretto Filho ..... Sao Paulo
C. F. Deichman, American Consul ..... Santos
Geo. H. Pickenell, American Consul ..... Para
Edward Higgins, American Consul ..... Bahia
Alfred L. Moreau Gottschalk, Consul General ..... Rio de Janeiro
L. O. Munch ..... Porto Alegre
Chas. L. Hoover, American Consul ..... Sao Paulo
F. I. Riberirs de Castro ..... Rio de Janeiro
Miguel Presgrave ..... Santos
Manoel Carneiro de Sanza Bandeira ..... Rio de Janeiro
Undecipherable ..... Florianopolis
Praencar Mathus ..... Sao Paulo

CHILE

Banco Espanol de Chile ..... Antofagasta
Banco Espanol de Chile ..... Iquique
Banco Espanol de Chile ..... Valdivia
Y. E. S. ..... Cordoba
John Sterett Gittings, Jr., Commercial Dept., Valparaiso Branch of the National City Bank ..... Valparaiso
W. R. Grace & Co. ..... Punta Arenas
The Coquimbo Agencies Co. ..... Coquimbo
John R. Bradley, American Consul ..... Punta Arenas
Alberto Fait & Co. ..... Punta Arenas
Mark R. Lamb ..... Santiago

COLOMBIA

Sociedad de Agricultures de Colombia ..... Bogota
Camara de Comercio de Bogota ..... Bogota
United Fruit Co., Chas. W. Sinners, Mgr. ..... Santa Marta
O. E. Guyant, American Consul ..... Barranquilla
United Fruit Co., Ahanino Klacio, Agent ..... Barranquilla

COSTA RICA

C. P. Cullen ..... Limon
Benjamin F. Chase, American Consul ..... San Jose
Salv. Cerda ..... San Jose

CUBA

United Fruit Co. ..... Preston
Geo. B. Starbuck, American Vice-Consul ..... Cienfuegos
Liborio Alvira ..... Cienfuegos

ECUADOR

J. G. White & Co. ..... Guayaquil
J. A. Cleveland ..... Guayaquil
F. W. Goding, American Consul General ..... Guayaquil
The Guayaquil Agencies Co ..... Guayaquil
Banco del Ecuador ..... Guayaquil
Louis A. Plaza ..... Guayaquil

GUATEMALA

Leon Guttman & Co ..... Guatemala City
Rodrigo Malina ..... Guatemala City
Antonio Tejeda A. ..... Barberena
C. M. Shaw, Division Manager, United Fruit Co. ..... Puerto Barrios
Topke & Co ..... Guatemala City

MEXICO

Norton F. Brand, American Consul ..... Salina Cruz
W. W. Graham, British Vice-Consul ..... Durango
Stephen E. Aguirro, American Consul ..... Ciudad Juarez
G. K. Donald, American Consul ..... Aguascalientes
Walter H. Sholes, American Consul ..... Nuevo Laredo
Francis R. Stewart, American Consul ..... Vera Cruz
Andres Gomez y Orejan ..... Vera Cruz
Gaylord Marsh, American Consul ..... Yucatan
W. E. Chapman, American Consul ..... Sinaloa
American Consulate ..... Frontera, Tabasco

NICARAGUA

Andrew J. McConnico, American Consul ..... Corinto
Max Sacora ..... Rivas
Ignacio Cardoze ..... Masaya

PANAMA

A. G. Snyder, American Consul General ..... Panama
Arosemena Hermanos ..... Panama
J. M. Kyes ..... Bocas del Toro
American Trade Developing Co. ..... Panama
G. A. Alvarado, Municipal Weights and Measures Dept ..... Panama

PERU

D. Dasso ..... Callao
Carlos Basadre y G. ..... Lima
Emilioran Oordt ..... Lima
Arequipa Agencies Co. ..... Arequipa
Piura Agencies Co. ..... Piura
W. R. Grace & Co. ..... Lima
The Salaverry Agencies Co ..... Salaverry

PORTO RICO

Finley, Weymouth & Lee, Inc. ..... San Juan

SAN SALVADOR

Fernando Sagren ..... San Salvador

SPANISH HONDURAS

Francis J. Dyer, American Consul ..... Tegucigalpa
Chas. N. Willard, American Consul ..... Ceiba
Lahi Culotta ..... Puerto Cortez

URUGUAY

National City Bank Branch ..... Montevideo
C. Perez Monteio y Ca ..... Montevideo
Reyuser y Taulmnat ..... Montevideo
William Dawson, American Consul ..... Montevideo

VENEZUELA

Banco Commercial de Barranquilla ..... Barranquilla
Karl Blashitz ..... Caracas
Homer Brett, American Consul ..... LaGuaira
Frank Anderson Henry, American Consul ..... Puerto Cabello
Emil Sauer, American Consul ..... Maracaibo

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